034-30

Development of Active and Nanotecnology-Based Intelligent Edible Packaging Systems: Physical-Chemical Characterization

Miguel A. Cerqueira, Maria J. Costa, Clara Fuciños, Lorenzo Pastrana, António A. Vicente

University of Minho, Braga, Portugal

Intelligent and active packaging, using edible and biodegradable biopolymers, appears in the last years as one of the most promising applications to food packaging. However, the release of antimicrobial substances from these biopolymers is generally achieved through passive diffusion mechanisms so that there is no real effective control of the process, being necessary to design systems that allow the controlled released as a response to environmental changes. It has been demonstrated that Poly(N-isopropylacrylamide) (PNIPA) nanohydrogels can protect natamycin from hostile environments and allows a smart natamycin release utilizing environmental stimuli. This work aims at characterizing polysaccharide-based films without (GA) and with the incorporation of free natamycin (GA-NA) and natamycin-loaded PNIPA nanohydrogels (GA-PNIPA). Transport (water vapor, oxygen, and carbon dioxide permeabilities) and mechanical properties (tensile strength and elongation-at-break), opacity and water sensitivity (moisture content and contact angle) were studied, being the chemical interactions studied by mean of FTIR; SEM analyses were performed in order to verify the presence of natamycin and nanohydrogel particles in the film matrix. Results show that natamycin and natamycin-loaded PNIPA nanohydrogels can be successfully added to edible films without changing their main properties. However, tensile strength decreased ($p<0.05$) when both natamycin and natamycin-loaded PNIPA were incorporated (from 24.44 to 17.02 and 16.63MPa, for GA-NA and GA-PNIPA, respectively). With the incorporation of free natamycin and natamycin-loaded Poly(N-isopropylacrylamide) nanohydrogels the films became more opaque and showed to be more sensitive to water. SEM images confirmed the presence of natamycin and Poly(N-isopropylacrylamide) nanohydrogels at the films’ surface. Natamycin can be successfully added to polysaccharide-based films and can be used as active packaging ingredient when used free in the matrix, or as intelligent packaging when loaded in Poly(N-isopropylacrylamide) nanohydrogels. Further studies should be done in order to evaluate the different release behavior of natamycin from the matrix into food.